CYTOTAXONOMIC NOTES ON SOME NEOTROPICAL GENTIANACEAE[1]

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Abstract

Chromosome numbers for 13 species in four genera of neotropical Gentianaceae are reported for the first time. The chromosome numbers suggest a relationship between *Symbolanthus, Macrocarpaea,* and *Chelonanthus* and support the separation of *Lisianthius* and *Chelonanthus.*

The Gentianaceae is a moderate-sized family, comprising approximately 800 species (Engler & Diels, 1936). Their distribution is essentially worldwide. In many cases generic limits within the family are poorly defined, and intergeneric relationships are poorly understood. Particularly troublesome are those approximately 100 neotropical members of the family which are supposedly related to *Lisianthius* P. Browne. In accordance with the genera accepted by Gilg (1895) this would include the following: *Macrocarpaea* Gilg, *Pagaea* Griseb., *Helia* Mart., *Irlbachia* Mart., *Lehmaniella* Gilg, *Adenolisianthus* Gilg, *Calolisianthus* Gilg, *Chelonanthus* Gilg, *Purdieanthus* Gilg, *Lagenanthus* Gilg, *Rusbyanthus* Gilg, *Symbolanthus* Don, and *Lisianthius* P. Browne. Taxonomic studies of this group of genera have been hampered not only by the paucity of specimens, but also by their miserable condition. *Macrocarpaea* is the only genus of moderate size for which a reasonably complete monograph (Ewan, 1948) is available.

With the exception of *Gentiana* and its segregates, little is known about the cytology of the family. There are apparently no published chromosome counts for any of the lisianthioid genera. Counts are reported here for the first time for thirteen species in four of the genera. The standard squash technique was used: Flower buds were fixed in modified Carnoy's solution, stored in 70% ethanol, and the pollen mother cells were subsequently squashed in acetocarmine. The results are listed in Table 1.

According to the most comprehensive treatment of the Gentianaceae (Gilg, 1895), *Lisianthius* and *Macrocarpaea* belong to the tribe Gentianeae, subtribe Tachiinae, while *Chelonanthus* and *Symbolanthus* belong to the tribe Helieae. In Gilg's treatment the Gentianeae and the Helieae, as well as most other major groupings within the family, were delimited on the basis of pollen grain morphology. Those genera whose pollen grains are united into tetrads were referred to the Helieae; all other genera supposedly are characterized by having separate pollen grains.

The findings of more recent authors suggest that Gilg's system is probably inadequate. Ewan (1948) argued that the genera most closely related to *Macro-*

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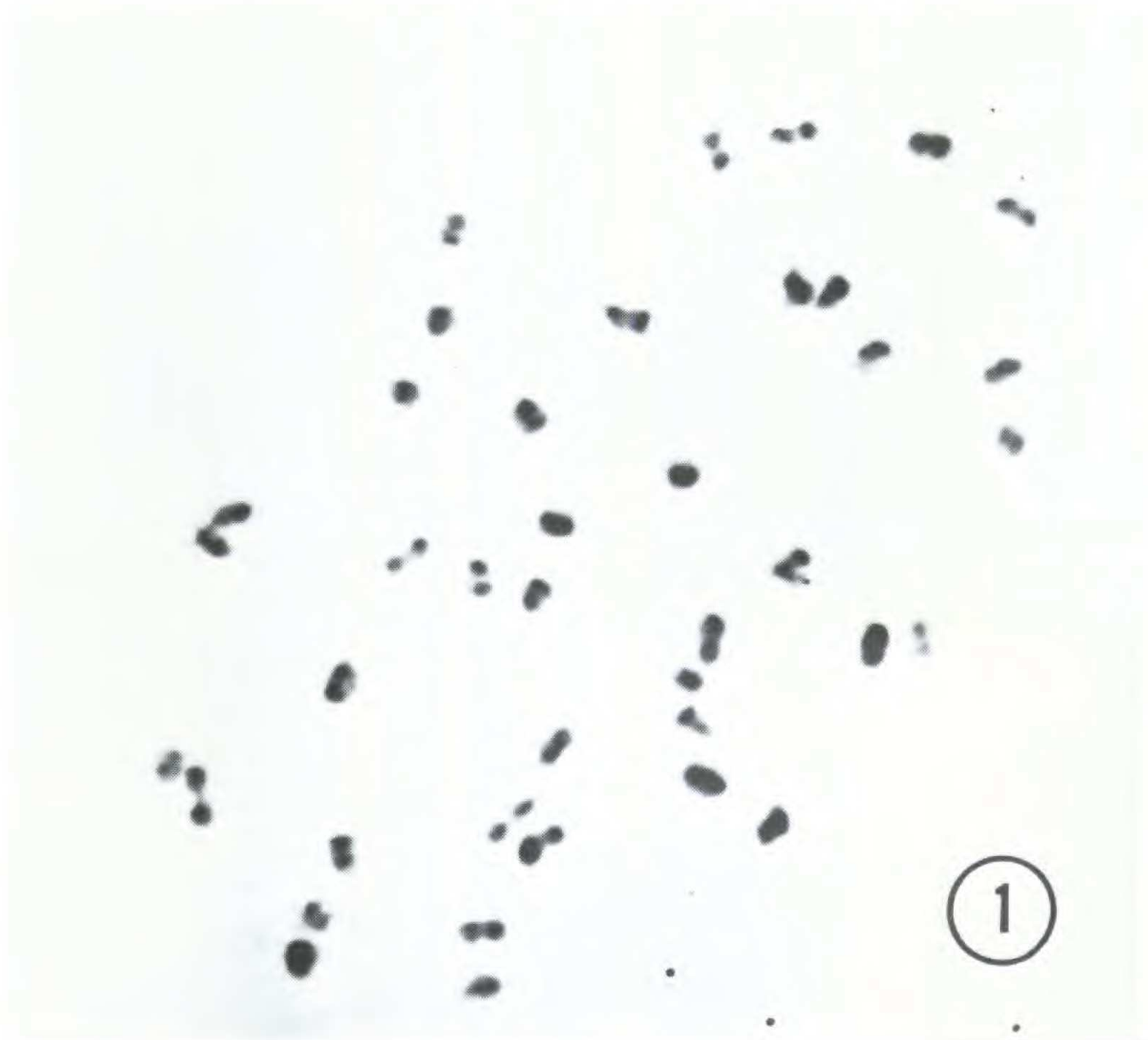
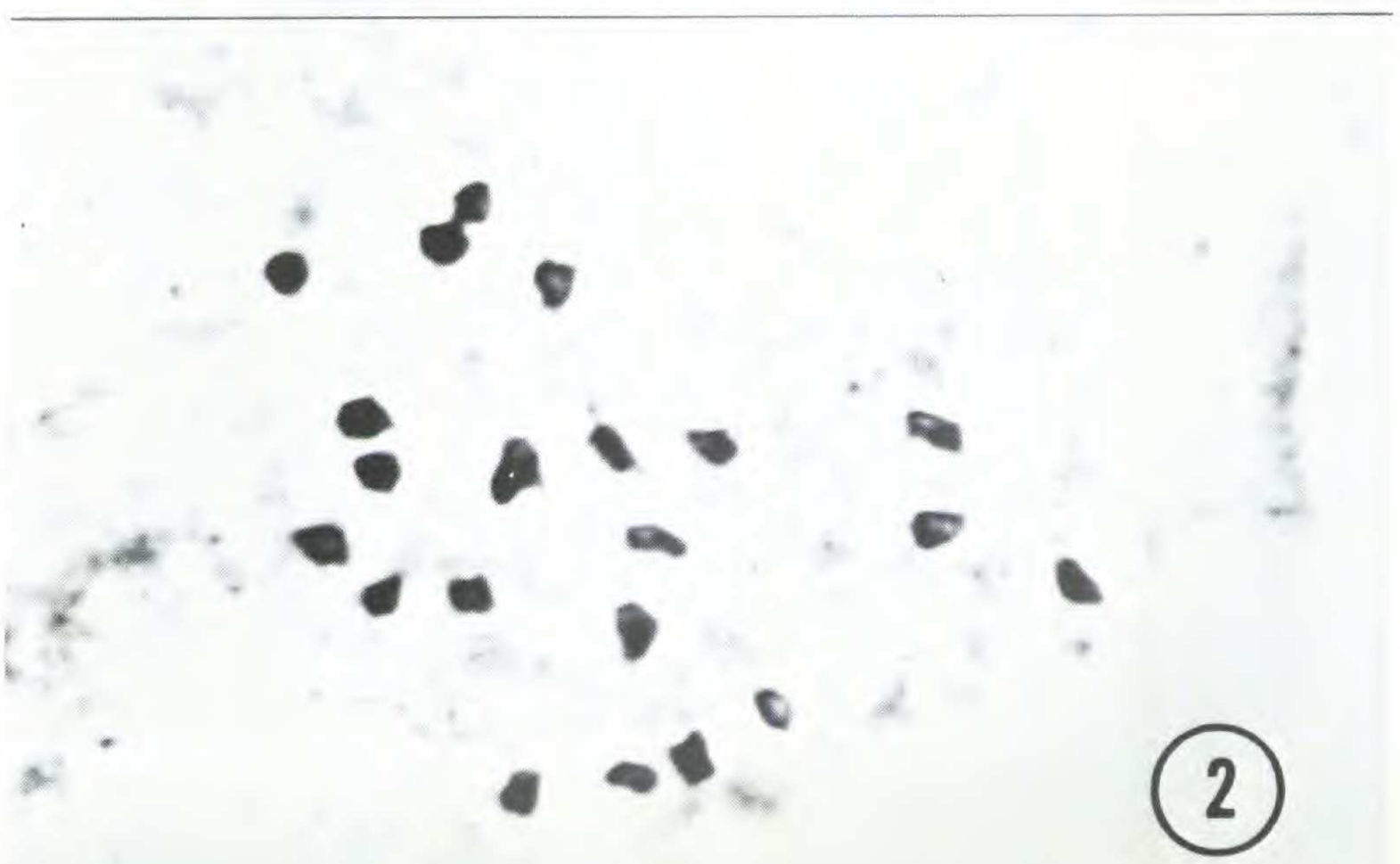
TABLE 1. Chromosome numbers in four genera of neotropical gentians.

Species	Collection Data	Haploid number
Symbolanthus pulcherrimus Gilg	COSTA RICA. CARTAGO: 13 mi. SW of El Empalme, *Weaver 1406.*	$n = 40$ (Fig. 1)
Macrocarpaea thamnoides (Griseb.) Gilg	JAMAICA. ST. ANDREW: Fairy Glade on Mt. Horeb, *Weaver 952.*	$n = 21$ (Fig. 2)
Lisianthius capitatus Urb.	JAMAICA. TRELAWNY: Road from Burnt Hill to Barbecue Bottom, *Weaver 1002.*	$n = 18$
Lisianthius cordifolius L.	JAMAICA. ST. ANDREW: Gorge of the Cane River, *Weaver 878.*	$n = 18$ (Fig. 3)
Lisianthius exsertus Sw.	JAMAICA. ST. CATHERINE: 1 mi. S of Parks Road, *Weaver 1042.*	$n = 18$
Lisianthius jefensis Robyns & Elias	PANAMA. PANAMÁ: Cerro Jefe, *Weaver 1481.*	$n = 18$
Lisianthius latifolius Sw.	JAMAICA. ST. ANDREW: Morces Gap, *Weaver 1827.*	$n = 18$
Lisianthius longifolius L.	JAMAICA. TRELAWNY: Road from Burnt Hill to Barbecue Bottom, *Weaver 997.*	$n = 18$
Lisianthius seemannii (Griseb.) Perkins	PANAMA. COCLÉ: 3.5 km SE of El Valle de Antón, *Weaver 1671.*	$n = 18$
Lisianthius skinneri (Hemsl.) O. Kuntze	COSTA RICA. ALAJUELA: 13.5 mi. E of Arenal, *Wilbur & Stone 10257.*	$n = 18$
Lisianthius troyanus Urb.	JAMAICA. WESTMORELAND: 0.5 mi. S of Moreland Hill School, *Weaver 1272.*	$n = 18$
Lisianthius umbellatus Sw.	JAMAICA. HANOVER: Dolphin Head, *Weaver 1832.*	$n = 18$
Chelonanthus alatus (Aubl.) Pulle	PANAMA. COCLÉ: 3.5 km S of El Valle de Antón, *Weaver 1672.*	$n = 20$ (Fig. 4)
	PANAMA. PANAMÁ: Cerro Campana, *Weaver 1696.*	$n = 20$

carpaea, at least on the basis of gross morphology, are *Symbolanthus, Calolisianthus,* and *Rusbyanthus.* The last was placed by Gilg in a monotypic tribe between the Gentianeae and the Helieae; *Symbolanthus* and *Calolisianthus* were placed in the Helieae. Nilsson (1968) found three general types of pollen in the genus *Macrocarpaea,* two with separate grains and one with grains united into tetrads. Of the separate-grain types, one, found in three species, closely resembles the type found in *Rusbyanthus.* Those with pollen in tetrads, a group of five species restricted to Trinidad and Venezuela, are ones which, according to Ewan "often demonstrate transitional characters toward the morphology of the genera *Symbolanthus* and *Calolisianthus.*" According to Nilsson, however, the pollen most closely resembles that of *Chelonanthus.*

The cytological evidence at this point is too scanty to give more than a hint of the relationships between the genera in question. However, *Chelonanthus,* with $n = 20$ chromosomes (Fig. 4), may be the base for a polyploid series and an aneuploid series in the Helieae, leading to *Symbolanthus,* with $n = 40$ chromosomes (Fig. 1), in the former case, and to *Macrocarpaea,* with $n = 21$ (Fig. 2), in the latter. *Eustoma russellianum* G. Don, of the Gentianeae-Tachiinae, has

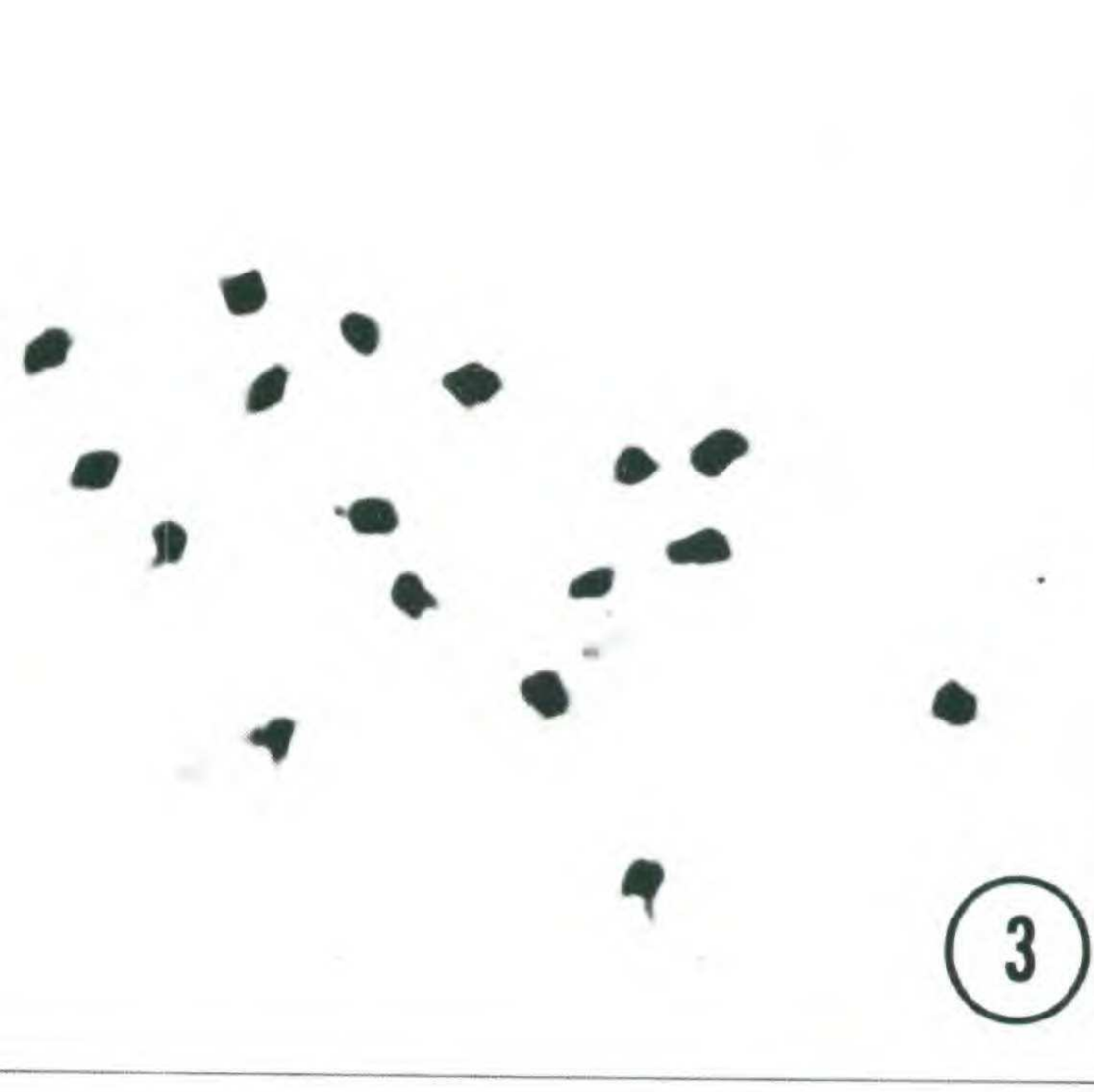




FIGURES 1–2.—Meiotic chromosomes of *Symbolanthus* and *Macrocarpaea*. — 1. *Symbolanthus pulcherrimus*, Metaphase I, × 1100. — 2. *Macrocarpaea thamnoides*, Metaphase I, × 1600.

$n = 36$ (Rork, 1949). *Lisianthius*, with $n = 18$ in all ten species investigated (Fig. 3), may be the base for a polyploid series in this subtribe.

Steyermark (1953) found no good morphological basis for maintaining *Chelonanthus* and suggested that it should be included in *Lisianthius*. Williams (1968), following Gilg (1895), pointed out several good corolla and inflores-



FIGURES 3–4.—Meiotic chromosomes of *Lisianthius* and *Chelonanthus*. — 3. *Lisianthius cordifolius*, Metaphase I, × 1500. — 4. *Chelonanthus alatus*, Metaphase I, × 1500.

cence characters for separating the two genera. Although a chromosome count is available for only one species of *Chelonanthus* ($n = 20$), the fact that all ten species of *Lisianthius* investigated have $n = 18$ chromosomes gives tentative support for the maintenance of *Lisianthius* and *Chelonanthus* as distinct genera.

The results of this study, meager though they may be, suggest that cytological data may prove valuable in determining generic limits and intergeneric relation-

ships in the lisianthioid gentians. However, much more work, cytological and otherwise, needs to be done before the taxonomy of these plants can be worked out with any confidence.

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